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AFRICAN MANLIKE APE SKULL NEW LINK IN MAN'S ANCESTRY

By Prof. Raymond A. Dart,
Witwatersrand University,
Johannesburg, South Africa

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(This is the first reliable description of the newly found African precursor of man to reach America. It was received from Prof. Dart, the discoverer, by cable from Johannesburg, South Africa.)

The skeletal remains of *Australopithecus Africanus* consist of two fragments. One is an endocranial brain cast (the form of the interior of the cranium) and this is complete and whole. The other is the face of the skull which was found completely imbedded in the limestone of an old cavern. This ancient cave was completely filled with bedded sand infiltrated with lime.

The site of the discovery is near the locality of Taung, Kalahari, Bechuanaland, and the cave is in the Kaap Plateau composed of dolomitic rocks.

The skull is dolichocephalic (long and narrow and somewhat oblong in shape). The face is leptoprosopic (relatively long and narrow).

The remains are those of a juvenile subject with the first permanent molars erupted. The brain has a size just slightly larger than that of an adult chimpanzee. The sulcus lunatus (the lunar fissure, one of the convolutions of the brain) shows a position approaching the same feature in the human being. The brain shows ^{marked}temporo-parieto-occipital expansion (enlargement of the posterior or back two-thirds of the cerebrum). There is an absence of the pre-rolandic and post-rolandic flattening of the skull. (That is, the muscles of the jaw at the stage of evolution shown by the skull had decreased in size due to lack of hard usage so as to allow the brain in the region of the temples to bulge out. This is a humanlike characteristic.)

The ridges above the eye orbits of the skull are absent (unlike those in apes). The eye orbits are rounded. The nasal or nose bones terminate above the line connecting the lower margins of the eye orbits. (This is human-like.) The upper dental arch is parabolic in shape (this type of setting for the teeth is more nearly human than that of the apes). The canine teeth are small and their diastema (the space between the canine and front teeth) is three millimeters. There is no diastema or space in front of the canine teeth of the lower jaw. This lower jaw resembles in its front portion the famous Heidelberg jaw.

Another point of importance showing the jaw's close approach to human characteristics is the lack of a simian shelf, a ledge on the interior of the lower jaw present in the apes. The canines of the jaws are small and lie in line with the slightly crowded vertical incisors or front teeth.

The foramen magnum (hole through which the spinal cord enters the brain) is placed well forward. (In the monkeys this is well to the rear of the skull and its location in the newly found skull indicates that the creature to whom it belonged may have walked upright.)

The specimens are diagnosed as those of a manlike or anthropoid ape, and classified as a new family, the Homosimiidae.

(By Science Service)

That the skull of the anthropoid ape child found by Prof. Dart in Africa is an important link in the ancestry of man is the opinion of Dr. Ales Hrdlicka, anthropologist of the Smithsonian Institution, after he had read and studied the exclusive article sent by Prof. Dart to Science Service.

The remains of this four year old child, just beginning to cut its first permanent teeth, will probably take their place beside Pithecanthropus, Piltdown man, and the other famous relics of man's evolution and antiquity. Buried as they were deep in limestone, Dr. Hrdlicka believes it probable that they date from Tertiary times, a time more ancient than any in which human remains have heretofore been found. In this case they have been preserved for hundreds of thousands of years.

The fact that the skull was so young when its owner met death is a disadvantage from the standpoint of anthropological study for the skull of a young ape has more human characteristics than the skull of an adult ape.

Yet there seems to be a little doubt but that there has been discovered on the reputed "dark" continent a most important step in the evolutionary history of man who arose from the same stock as the present apes. Australopithecus Africanus is probably more remote in human ancestry than Pithecanthropus, the ape man of Java, up to now considered the oldest manlike creature known to science.

Australopithecus was not an ape-man like Pithecanthropus, but a man-ape. He was a creature who emerged just before the dawn of man. He is one of those beings popularly known as a "missing link", intermediate forms having both human and ape-like characteristics.

Australopithecus may be related to America through two lines, that of man and monkey. The descendants of Australopithecus through evolutionary processes may have become modern man. His ancestors evolving in a different direction may also have given rise to the kind of monkeys that now inhabits South America.

Dr. Hrdlicka believes that the new African man-ape is more closely related to the old African stem of the American monkey than to the type of monkey now living in the old world. It is generally conceded that the American type of monkey came from Africa in Tertiary times when there was a land bridge between Africa and South America. In characteristics, Australopithecus resembles the American type of monkey more closely than the African.

AFRICAN SKULL MAY BE IMPORTANT LINK IN MAN'S EVOLUTION

The present discovery by Prof. Dart takes on added interest because of the very primitive skull found some three years ago in the course of mining operations at Broken Hill in northern Rhodesia, Africa. A cast of this famous skull has just been presented to the Smithsonian Institution by the British Museum of Natural History and Dr. Hrdlicka characterizes it as "most puzzling". With features that are so old that they date back to the middle of the glacial period this skull was found associated with the bones of animals still living in Africa. Yet no race of man now living on earth could be the progeny of this strange Rhodesian man, Dr. Hrdlicka declares; even the primitive negro is quite different and far removed from this earlier African inhabitant.

The other most ancient remains of man or his precursors known to science up to the present time are:

The bones of *Pithecanthropus erectus*, Java ape man and human precursor, found by the Dutch professor, Eugene Dubois, and kept in seclusion by him for thirty years. Casts of the cleaned skull and leg bone were recently made by Prof. Dubois' own hands and sent to the Smithsonian Institution.

The Piltdown jaw, which Dr. Hrdlicka believes is much older and much more primitive than the Piltdown skull found at the same place in England.

Teeth of high grade anthropoid apes found in Europe and India.

Heidelberg man whose jaws and teeth were found 82 feet below ancient river deposit near the village of Mauer, Heidelberg, Germany.

The Ehringsdorf man found in the last decade near Weimar, Germany, under 35 feet of limestone.

Neanderthal remains in western and central Europe which date over a very long period.

NEW UNIVERSES VIE WITH MINUTE ANIMALS IN SCIENCE PRIZE AWARD

Protozoa and universes divided honors when the American Association for the Advancement of Science announced that the \$1000 prize for the best scientific paper delivered before the recent meeting of that association is to be divided equally between Dr. L. R. Cleveland of Johns Hopkins University for his research on the minute parasitic protozoa living in termites or "white ants", and Dr. Edwin Hubble of Mount Wilson Observatory for his studies that prove the spiral nebulae to be great stellar galaxies comparable in size to our own Milky Way and 6,000,000,000,000,000 miles away.

The prize committee after a month of deliberation and the detailed consideration of many of the thousand or more papers delivered before the Association and its sixty-three affiliated societies picked the work of Drs. Cleveland and Hubble as the most important pieces of original research presented at the many sessions.

The money for this \$1000 prize now awarded for the second time is contributed by an anonymous layman living in New York City who has announced his intention of making the prize an annual event.

Last year when the meeting of the American Association was held at Cincinnati the prize was given to Dr. L. E. Dickson of the University of Chicago for his work on mathematical theory.

UNIVERSE EXPANDS WHEN ASTRONOMER DISCOVERS OTHER STELLAR SYSTEMS

The limits of the universe have been pushed outward and great stellar systems comparable to our own tremendous galaxy are shown to exist by the astronomical research of Dr. Edwin Hubble that won for him half of the \$1000 prize.

Using the largest telescope in the world, the 100 inch reflector at the Carnegie Institution's Mount Wilson Observatory at Pasadena, Calif., Dr. Hubble has solved the mystery of the great heavenly objects that look like pinwheels in the sky, the spiral nebulae.

Nearly overhead in the sky at the present time in the constellation of Andromeda there is the most famous of these spirals, the Great Nebula of Andromeda. To our eyes viewing it from the earth it has several times the area of the full moon although it is so faint that good sight is required to spot it in the heavens.

In small telescopes it looks merely like a cloud of matter, but when Dr. Hubble turned the great Mt. Wilson 100-inch telescope upon it, he found the outer ends of the spiral contain immense numbers of very faint stars, a hundred thousand to a million times fainter than the stars that the naked eye can see.

A study of such photographs and the application of known astronomical laws led Dr. Hubble to the following facts about the Andromeda nebula.

It is so distant that it takes light nearly a million years to travel from it to the earth. That is, it is some 6,000,000,000,000,000 miles away.

It is the most distant object known to science.

It is as large and has as much stuff in it as our own galaxy.

Its total light is one billion times that of the sun.

It contains some three or four thousand million stars.

In shape and form it is not unlike the great stellar system or galaxy of which the Milky Way and most of the stars we see at night are a part and in which the sun and its revolving planets are but pin points.

It is at four times as great a distance as ever previously established for any celestial object, with the exception of the faint star cloud N.D.C. 1 6822 which Dr. Hubble has shown to be 750,000 light years from the earth.

It is an "island universe", a concentration of stars, gaseous stuff, and perhaps even planets, out in the space of the great all-inclusive or super-universe and billions of miles away from other universes or galaxies like our own.

And the spiral in the constellation Triangulum seems to be nearly a twin to that in Andromeda.

How can evidence of such gigantic "universes" be obtained?

First of all Dr. Hubble's photographs, better than any previously obtained, showed "dense swarms of actual stars" in the outer parts of spiral nebulae. Then it was found, by taking photographs night after night, that some of these stars were what is called Cepheid variables. They fluctuate in brightness, going through a period of sudden rise to brilliance and slow fall to dimness in times ranging from a few hours to 50 days. At maximum they range from 4000 to 8000 times the sun's brightness. This was the clue to the determination of the great distance of the nebulae.

Some years ago Dr. Harlow Shapley of Harvard worked out a useful relationship between star brilliance and the period of these Cepheid variables, so named because they are most prevalent in the constellation of Cepheus. He found that if the period of variation was known the absolute brightness, dependent only upon the temperature of the star and not upon its distance from the earth, could be determined. A simple comparison of absolute brightness of the star with the brightness shown through the telescope tells the distance of the star from earth.

When Dr. Hubble applied this law to the variable stars he discovered in the Andromeda nebula, he found that they were all about 930,000 light years away in another island universe.

While Dr. Hubble is the first man to prove the distant existence of such vast conglomerations of matter outside our own locality of space, their character has been suspected for about a century. Sir William Herschel, English astronomer of 100 to 125 years ago, when he saw the spiral nebulae poetically called them "island universes". The name stuck and now Dr. Hubble has given it justification.

Undoubtedly more distant spiral nebulae, now known to be stellar galaxies, lie even farther out in space. There are more than 100,000 of these spirals known to astronomers and most of them instead of being great patches of light like the one in Andromeda, appear merely as points of light in telescopes and on photographs.

Imagination totters when it attempts to conceive of the distances that must intervene between these galaxies or "universes" and our own.

Space, or the super-universe, with the aid of Hubble, Einstein, and other scientists, has been swollen enormously in the past few years.

PROTOZOA KILLING PROMISES TO AID MAN'S HEALTH

Killing of the thousands of minute animals that inhabit termites or "white ants" and digest their woody food for them may seem an unimportant accomplishment. Yet this is what won Dr. L.R. Cleveland, National Research Council fellow working at the Johns Hopkins University, Baltimore, half of the annual American Association for the Advancement of Science prize.

The microscopic protozoa that live in the digestive tracts and blood systems of man, animals and insects are mostly harmless or helpful, yet there are some that cause serious diseases, like malaria, sleeping sickness and dysentery. The importance of Dr. Cleveland's success in killing the protozoa of termites without hurting their involuntary hosts lies not in the practical application of this one accomplishment, although the method may be used in destroying troublesome "white ants", but in the promise of new biological and medical methods that it contains. His new technic has possibilities of application in widely different fields ranging from the cure of disease to the protection of property.

Dr. Cleveland's studies began about five years ago, on the protozoa that inhabit the digestive systems of termites, or "white ants", wood-eating insects very destructive to all timber structures in the southern states and in all warm countries. He found that they played a very important role in the lives of most species of these insects. In some termites half the body weight is made up of swarms of protozoa. Dr. Cleveland, wondering whether these internal guests might not be necessary to the termites, sought for methods to kill them without killing the hosts. He found that this could be accomplished in any of three ways: 1. By keeping his termites at a temperature of about 95 degrees Fahrenheit for 24 hours; 2. By starving them for a time; 3. By exposing them to air or pure oxygen under pressure. Under any one of these treatments the protozoa perished and the termites survived.

But they did not survive long. Deprived of their "inhabitants", they starved

to death in three or four weeks, even though they had plenty of wood to eat. Apparently they cannot digest their customary diet without the assistance of their colonies of protozoa. Dr. Cleveland suggests a method for taking advantage of this discovery torrid a house of termites. "Close it up thoroughly," he says, "Cut off the termites' retreat through the basement to the ground. Fire the furnace to the limit, until you get a temperature of 95 degrees or higher. Keep it that way until you are sure the walls have been heated through for twenty-four hours. Or if you can get a temperature of 110 degrees or more, a much shorter period should suffice. With their protozoa dead, the termites should die of starvation in the midst of plenty."

More important, however, in Dr. Cleveland's opinion are the possible uses of his discovery in promoting health, through adaptations of his methods of killing protozoa with oxygen. He found that if pure oxygen were substituted for air at ordinary atmospheric pressure, or, what amounts to the same thing, if air with its twenty per cent. content of oxygen, were supplied at five times the usual pressure, the protozoa in the bodies of termites and cockroaches could be killed in an hour or less, while the insects could stand the treatment for much longer periods - in some cases indefinitely. When pure oxygen was applied under pressure, the protozoa died even more quickly, and there was less risk to the host animals. Cold-blooded vertebrates, like frogs, also survived this treatment, but success has not yet been attained with warm-blooded animals. Dr. Cleveland is now contemplating further experiments on rats, in an endeavor to find and eliminate the causes of failure.

For more immediate results, however, Dr. Cleveland, in a second series of experiments on the warm-blooded animals, is searching for a chemical that will release oxygen to kill the internal protozoa without injuring the body tissues. He has had partial success with those he has already tried, and is now awaiting the arrival from Germany of a new compound which is claimed to be particularly efficient.

THE SUN AND OUR WEATHER

By Dr. Charles Greely Abbot,

Assistant Secretary, Smithsonian Institution

(Dr. Abbot keeps the closest watch on the sun of any man on earth. In this article, written for Science Service, he points out the immense practical possibilities that lie in knowing the exact effect of variations in the energy poured forth by the sun.)

There seems to be evidence to show that very moderate changes in the sun's heat, without much affecting the average temperature of the world as a whole, may yet make the difference between prosperity and failure in some localities here on earth.

The studies of H. H. Clayton, an American meteorologist, show plainly that major changes of the barometer and temperature in the United States come from solar variations. About 10 years ago, Mr. Clayton, then chief forecaster for the Argentine Government, began a long thorough investigation of just exactly what happens to barometers, thermometers, and rain gauges all over the world when the sun's heat changes. By 1920, he was actually employing solar measurements of the Smithsonian Institution to make public official forecasts a week in advance for the

temperature and rainfall of Buenos Aires. These weekly forecasts are still maintained.

At first sight the matter is very simple! You would all probably say that if the sun sends more heat the weather would grow warmer, if less heat, cooler. But the subject is more complex. A place tends to be warm or cold according as its prevailing winds come from tropical or polar directions. In the atmosphere there are regions of low barometer and regions of high barometer. Look on the weather map and you will see that in the United States the winds blow counter-clockwise all around the low centers, and clockwise all around the high centers. Meteorologists call these effects cyclones and anti-cyclones.

If now the system of cyclones and anti-cyclones is shifted north, south, east, or west by any cause, there will be a change of wind and consequently a change of temperature. Rainfall also is modified. According to Mr. Clayton's researches this is exactly what happens when the sun's heat changes. The barometric highs and lows move a few hundred miles, and alter the wind directions, and with them the weather.

Data for stations all over the world and for all seasons of many years must be compared with recorded solar changes before meteorologists will be in shape to begin predicting from the state of the sun's heat. This great work is only begun. That is why our Weather Bureau does not use these methods of forecasting.

The part of the Smithsonian Institution in this new movement is to secure regularly accurate measurements of changes in the sun's heat. We began to make these studies over 20 years ago in Washington, but soon found it necessary to move to clearer skies. We discovered that the sun's heat varies and after years of research that took us to three continents we established in 1918 an observatory in the Nitrate Desert of Chile where it almost never rains and where there is neither animal, insect, reptile, nor vegetable life, and where all water and supplies must be hauled many miles. From this observatory nearly 10,000 feet above sea-level, and at another station on a mountain in Arizona, over a mile high, daily solar observations are made and daily telegraphic reports are sent to the Smithsonian Institution.

There is great difficulty in making observations accurate enough. The sun's changes seldom exceed 3 per cent. though sometimes reaching 5 per cent. or more. Mr. Clayton's results indicate that solar changes as small as 1 per cent. or less are yet great enough to produce noticeable effects on the weather. It is only lately that we have succeeded in refining methods to this degree of accuracy. But for about two years past our two stations, which lie over 4,000 miles apart, have agreed together to about one half of one per cent. on the average of all good days, and have agreed in showing solar changes of from one to five per cent. For over two years they have indicated that the sun's heat has been generally from one to two per cent. below normal, but at present it is nearly up to normal again, and apparently seems marching towards higher values.

Between summer and winter, and between night and day, enormously greater changes than three or five per cent occur and we adjust ourselves to them. Why should we worry about such seemingly small changes in the sun's heat?

The answer is that the food plants, the great cities, and others of the most important things in the world are found exactly where they are because they are all adjusted to exactly the climatic conditions which prevail. And those adjustments are apparently very capricious. Why do palms grow in southern England,

which lies as far north as our bleak Labrador coast, for instance, and why do people winter in the south of France, as far north as Ottawa, while in America people go to Florida or southern California to get mild winters?

What I am driving at is that a little change in the quantity of solar heating might alter the distribution of heat over the earth in such a way as to produce perfectly astounding changes. One per cent change of the heat available to warm the air over the enormous area of the tropics may be of little effect there but may easily produce very much larger effects towards the poles. For the areas of the zones grow less towards the poles. It is like the tides. On the open oceans they oscillate only a foot or two, but in the confined Bay of Fundy the tidal wave is over 40 feet high.

One looks forward to a time when daily telegrams shall come to a central station from at least four solar radiation observatories instead of from two as now and the condition of the sun shall be broadcasted for the use of meteorologists the world over. For, after all, the temperature and all life on the earth hangs on the sun's rays. They ought to be thoroughly investigated so that we may be informed in advance what we are to expect as the consequences of changes in the sun.

SUN SPOTS CONTROL ANIMAL POPULATIONS, SCIENTIST CLAIMS

Periodic increases in the numbers of certain animals are blamed on the sun and its spots by C. S. Elton, of the department of zoology and comparative anatomy of the University of Oxford. Extraordinary as this conclusion may seem, Mr. Elton offers scientific data to show that animals populations are influenced by the well known sun spot cycle.

By methods of mathematical analysis it is possible to recognize definite climatic cycles, he says, even in a country with a variable climate. In seeking the causes of these variations it is reasonable to look to the sun, the source of practically all our energy. For over 150 years records have been kept of the number of sun spots. These increase to a maximum about every eleven years. Increase in the number of sun spots is accompanied by an increased output of energy by the sun, and, strange to say, by a low temperature on the earth. Further, the average annual temperature of the whole earth, the atmospheric pressures and rain-falls of various parts of the earth, the tracks of storms in North America and the rate of growth of the redwood tree, have all been found to show marked eleven-year fluctuations which correspond to those of sun spot numbers. There are natural records in the case of the redwood dating back in many cases three or four thousand years.

Turning now to variations in the numbers of animals, if the return of rabbit skins taken by the Hudson Bay Company be consulted, the interesting fact is established that the numbers increase to a maximum every eleven years, and that each maximum corresponds to a sun spot minimum. The fur returns of this company, which have been kept since 1845, give a good index of the total rabbit population; hence the conclusion is reached that variation in the number of sun spots in some way affects the rate of reproduction of rabbits.

Biologists cannot yet explain this extraordinary relationship, but it seems

likely that the explanation will be found in the effect of sunlight on animals, both directly and indirectly, through their food. It is common knowledge now that the antirachitic vitamin is intimately related to sunshine.

The lynx and the fox feed on the rabbit, so it is not surprising that the numbers of these animals, too, vary in well marked eleven-year periods.

Another interesting little animal in this connection is the lemming, which lives in the Arctic regions. Periodically it attains vast numbers, and it migrates usually from the mountains to the lowlands, often even into the sea. Such migrations occur contemporaneously throughout Norway, Sweden and Northern Canada, and probably throughout the whole Arctic regions.

"The spectacle of processions of lemmings ecstatically throwing themselves over the ends of railway bridges, and falling to an apparently useless death beneath the sea strewn with dead lemmings like leaves on the ground after a storm; lemmings making a bee-line across crowded traffic oblivious to danger; all these things are bound to make people talk," Mr. Elton says. "The lemming-years are such conspicuous phenomena that it is safe to assume that all which have occurred since about 1860 have been recorded. Lemming-years in Norway have the status of great floods."

By studying their records it is found that their frequency is about three and one-half years, not eleven years as in the case of rabbits. Close examination of meteorological data shows that climate too fluctuates in three and one-half year periods, particularly in Arctic regions. The cause of this short period fluctuation is not known.

In the same way as the fox and lynx benefit by years of large rabbit numbers, so in lemming-years large numbers of short-eared owls collect to feed on them, and peregrine falcons, which in normal years do not visit Norway, collect in large numbers to feed on the owls. In Greenland Arctic foxes tire of ptarmigan in lemming-years and so allow it to breed and attain large numbers in the year following the lemming-year. Then the Arctic fox decides that he likes ptarmigan after all and down go the ptarmigan numbers.

DIPHTHERIA DANGER HIGH IN ISOLATED COMMUNITIES

Isolated communities such as Nome are in particular danger from epidemics of diphtheria, not only because medical supplies may be far off and hard to get, as in the present instance, but also because isolated populations apparently tend to become more susceptible than those in thickly settled regions. Dr. J. A. Doull, of the Johns Hopkins School of Hygiene and Public Health, points out certain peculiarities in the behavior of the disease that makes it an especial menace to lonely places.

As everybody knows, diphtheria is peculiarly a disease of children, Dr. Doull says. Its greatest incidence is among children three years old. After that age the number of children contracting the disease fall off rapidly; there seems to be a gradual upbuilding of immunity, beginning very early in life. Little is known of the means by which this immunity is acquired, but apparently we are always getting slight infections, and by throwing them off we store up enough natural antitoxin in our own blood to prevent a serious attack.

These slight infections are kept in circulation in settled regions, for there are always diphtheria "carriers" about; but in isolated places they may never occur at all, and the opportunity for building natural resistance will be correspondingly absent. Then when a really serious infection is introduced it spreads rapidly among a highly susceptible population.

Dr. Doull cites a case somewhat analogous to that of Nome, which was studied by Dr. A. J. Metcalfe, an Australian physician, only a year or so ago. Off the north coast of Australia, in the Torres strait, there is a bit of land called Thursday Island. The population is largely a mixture of Malays and Asiatics, with surviving native elements. Dr. Metcalfe used the Schick test on a large number of children in the schools, ranging between the ages of six and fifteen, and found that nearly 97 per cent. of them were susceptible to diphtheria. With this nearly complete susceptibility Dr. Doull contrasts the figures obtained in Baltimore, which has been more thoroughly surveyed for diphtheria statistics than any other city in the United States. Here 93 per cent of the children one year of age were shown to be susceptible; but at six years the susceptibility had fallen off to 69 per cent., and at fifteen to 27 per cent. Figures for the semi-isolated conditions of rural life in America stand intermediate between those for crowded cities and those for this highly isolated island.

Another fact mentioned by Dr. Doull which supports this apparent relation between crowding of populations and the development of immunity to diphtheria, is the high rate of natural immunity found in asylums and similar institutions for the care of children.

A further suggestion developed in the discussion was the possibility of the development of an especially virulent type of the disease in isolated and highly susceptible communities, which might be more dangerous and difficult to combat if brought back to more thickly settled communities. It is a well known fact that a strain of disease germs gains in virulence upon being "put through" several successive non-immune persons or animals, and this suggests a possible danger from the present Nome epidemic.

TABLOID BOOK REVIEW

EXPERIMENTAL VEGETATION: THE RELATION OF CLIMAXES TO CLIMATES: By Frederic E. Clements and John E. Weaver. 172 pages; 15 plates. Washington: The Carnegie Institution of Washington. (Publ. No. 355) 1924.

THE PHYTOMETER METHOD IN ECOLOGY: THE PLANT AND COMMUNITY AS INSTRUMENTS. By Frederick E. Clements and Glenn W. Goldsmith. 106 pages; 11 plates. Washington: The Carnegie Institution of Washington. (Publ. No. 356) 1924.

These two books are valuable additions to the literature of ecology that is being built up by Clements and his associates who have for years been at work on the western grasslands. They mark a distinct advance in the development of quantitative and physiological methods in this branch of botany. The method of using plants themselves as instruments for the measurement of ecological factors while not strictly new is here taken seriously and treated thoroughly; so that the phytometer method may fairly be said to date from this publication.

desperate. The child's life was saved and at last reports she was well on the road to recovery.

The operation of parathyrin in normal persons and animals seems to be connected with the quantity of lime in the blood. Tetany is accompanied with disturbances of the calcium concentration, and when the extract is administered normal conditions are restored.

EXPEDITION TO PENETRATE HOMELAND OF PANAMA'S WHITE INDIANS

An expedition to further explore the area inhabited by the White Indians of Panama is about to penetrate into the interior of this country, hitherto practically unknown to all except the white and brown Indians.

Dr. and Mrs. Reginald G. Harris have joined Richard O. Marsh, who took three white Indian children and five brown Indians to the United States last summer, in this attempt to learn for science more details about the origin and cause of the unusual presence of many white-skinned Indians among the brown San Blas and mountain tribes. With Marsh also is Maj. Herry B. Johnson, naturalist, who accompanied him last year on his trip of exploration in this part of Darien.

is

Dr. Harris/director of the laboratory of the Long Island Biological Association at Cold Spring Harbor, N.Y. and he has already studied many of the White Indians along the coast with a view to solving the biological puzzle of their origin. Mrs. Harris is a daughter of Dr. C. B. Davenport, director of the department of genetics of the Carnegie Institution of Washington.

Marsh left the United States January 2 and brought back to their native land all but one of the Indians whom he took north last summer. The smaller White Indian boy, a youngster of eleven, named Chepu, has been adopted by the Marsh family at Brockport, N. Y.

Reports reaching the coast indicate that there is much unrest among the mountain tribes who threaten an uprising against the negro rubber hunters who are penetrating the country and raiding the Indian plantations. All of the Indians are very friendly to the Marsh party, however. Among the brown San Blas Indians taken to the United States by Marsh was Iqua Negappi, "crown price" of the San Blas who will one day rule the whole coast.

WOMEN SCIENTIST SHOWS HOW LICHENS PULVERIZE ROCKS

The activity of lichens, the gray or brown crusts of plant growth that splotch rock surfaces in "weathering" stone has been studied in Aberystwyth, Wales, by Miss E. J. Fry who has demonstrated the simple but efficient means by which these lowly plants literally pull the rocks to pieces. It is a well known fact that if gelatin or agar-agar jelly is allowed to dry in glass vessels thin flakes of glass are split off from the surface of the vessel in contact with the gelatin. The phenomenon may be described as due to the gelatin first sticking very tightly to the glass surface and then contracting when it dries. In contracting the outer edges of the gelatin ^{takes} flakes of glass with them.

Lichens in wet weather are surrounded by a gelatinous layer which sticks tightly to the rock on which they grow. In hot dry weather this gelatinous layer contracts, its edges curling away from the rock face. If these edges be examined they are seen to be covered with a thin layer of rock which has been peeled off.

Miss Fry in her paper recalls the great damage often done by organisms to the glass in church windows. Work done by a French investigator suggests that in this case chemical action is important in the early stages, but it seems highly probable that in this case, too, the alternate spreading of gelatinous lichens and their shrinkage in hot weather play their part.

AUSTRIA BUILDS FIRST AVALANCHE OBSERVATORY

An observatory for avalanches, believed to be the first of its kind, has been erected in Tamischbachturm, in the province of Steiermark, Austria, by the state railway. Its object is both scientific and practical. It has been fitted with instruments for the recording of exact data, and it will also send out warnings to stations below when avalanches threaten. It is also planned to "set off" incipient avalanches, and so prevent them from launching themselves later spontaneously and without warning.

FERNS MAY BE ERADICATED FOR CARRYING BALSAM DISEASE

Some of our most beautiful ferns may fall under the ban which the government is placing on gooseberries and barberries, according to S. A. Weatherby, noted fern specialist. Her reports that species of rust attacking balsam firs with destructive force are found to have ferns for their alternate hosts. Both eastern and western balsams are infected, and ferns guilty of transmitting their disease are found on both coasts. Among them are the beech fern, the sensitive fern, the marsh fern, the western ladyferns, brackens and polypodies.

RADIO DISTRESS SIGNALS SENT OUT AUTOMATICALLY FROM SHIP

A device which sends out distress signals from ships automatically has been invented by M. Passaquin, a young engineer. The instrument consists of wheels with projections around the edges corresponding to the signal, SOS, certain numbers which will give the latitude and longitude of the vessel, and the radio call of the ship.

An ordinary electric motor operates the machine which is mounted on a table. Each wheel is set at the proper angle and the motor started. The signal flashes three times and then stops. After a short pause the signal is flashed again and again until the motor is forced to stop running.

Ships or lifeboats equipped with this new invention do not have to have radio operators in order to send out messages of distress. A special dial on the transmitter may be set every day with the exact location of the ship and the motor turned on to operate the set whenever an emergency arises.

FAMINE IN CHINA MAY YIELD TO SCIENCE

Famine in China may be forced to yield to scientific farming. The University of Nanking has undertaken experiments to improve the principal food crops of China with the assistance of the International Education Board and Cornell University. Dr. H. H. Love of the department of plant breeding in the New York State College of Agriculture at Cornell will sail in March to assist in organizing the work. Improved strains of the various food crops must be developed so that the Chinese farmer can obtain an increased yield at only a small increase in cost. Dean J. H. Reisner of the College of Agriculture and Forestry at Nanking who is in charge of the work has sought American aid in the plant breeding part of the scheme.

AFRICAN MOUNTAIN TRIBE HAS STORY OF THE FLOOD

A story of a universal deluge, similar to that related in the Old Testament, as part of the tribal legends of a community of negroes in British East Africa, is one of the numerous items of interest in a report by the Hon. Charles Dundas, Senior Commissioner of Tanganyika Territory. The negroes are of the Wachagga tribe, and live on the lower slopes of Kilima Njaro, the highest mountain in Africa; a mountain which, though it is almost on the equator, has a cap of perpetual snow.

The Wachagga not only have a flood story, but other legends similar to the accounts in the Book of Genesis; for instance, a story like that of the Fall of Man, and one suggesting the account of the crime of Cain. Mr. Dundas is not of the opinion that these legends are fragments of the teachings of earlier, and now forgotten, missionaries.

They also have a tradition of a great fire on Kilima Njaro, which is an extinct volcano. But the account is so indefinite, both as to details and date, that there can be no certainty as to whether it actually records a comparatively recent eruption of the mountain.

NOTORIOUS WOLF OUTLAW KILLED BY GOVERNMENT HUNTERS

A lone wolf recently killed by hunters of the United States Biological Survey is credited by ranchers of the Southwest with a slaying of live stock valued at fully \$25,000. This snarling killer is said by government scientists to have roamed at different times over western Texas, New Mexico and Arizona, but the latter state is believed to have been the scene of most of his depredations. He was suspected several years ago of being responsible for numerous raids upon sheep herds and groups of calves on the plains. Ranchers organized to trap him but the wolf developed an uncanny talent for evading steel traps and also was successful in eluding hunters armed with long range rifles.

The beast is said to have been solitary in habit, unusual for one of wolf tribe, and to have done most of his raiding on dark, cloudy days when the ranch lands were swept by blizzards. The day time raiding was peculiar to the sheep sections, while in the cattle country the wolf selected the night to attack calves. This fact disclosed that the beast was gifted with the sense of knowing that sheep were better protected at night than were cattle. The killer was recently slain by rifle shot while he was raiding a cattle herd on an isolated range of eastern Arizona. The beast is credited by the Biological Survey as being the most ferocious killer of the wolf tribe yet slain by the government hunters.

GERMAN SCIENTIST SAYS FISH SMELL

The popular idea that the sense of smell consists of detecting minute traces of gaseous substances in the air, that taste consists of detecting substances dissolved in water, and that therefore fish cannot be said to have a real sense of smell has been attacked by a prominent German physiologist, Prof. Karl von Frisch, of Breslau.

Prof. von Frisch states that the nerves of the taste-organs of fish, which are located not only in their mouths but also on other widely scattered spots on their bodies, are connected with quite different nerve trunks, leading to a different part of the brain, than those of the fishes' nostrils. He claims also that the two groups of organs work differently.

Normal fish were able to detect very faint traces of food flavors which he put into their tanks, and began to hunt about for their dinners; while if he put their nose-nerves out of commission by a slight operation they were totally indifferent to the "odors", even though their taste nerves were still in order. In another experiment he learned that the amphibian newts and salamanders used the same organs on land for detecting the presence of worms underground that they used in the water to find worms that he had tied up in a bag and dropped into their aquarium.

Prof. von Frisch therefore concludes that "smelling" serves to detect very minute stimulations and thus makes it possible for a fish or other aquatic creature to discover food, even at a considerable distance; while "tasting" examines stimulants which are generally more concentrated, at close quarters.

STORAGE BATTERY SOLUTIONS INFERIOR TO PLAIN ACID

A new electric charge cannot be poured into a storage battery in the form of a patented solution, despite all claims of dealers to the contrary. This is the official conclusion of the National Bureau of Standards after tests of many such substitutes for sulphuric acid. And, says the Bureau: "Although the materials and coloring matter considered individually may be harmless, the disadvantages in using such solutions more than offset any temporary gain."

These special solutions which are often of too great strength may seem to give the battery a fine "kick" to start the car on a cold morning. But the owner will probably pay heavily for this in damaged separators or plates. Such solutions often contain sodium and magnesium salts, but have only the usual acid concentration. That "such material is without beneficial effect" is confirmed by the Bureau because the voltage, total charge, and the efficiency are in no wise improved.

Adding anything except pure sulphuric acid of proper strength may cause damage to the battery plates. This happens especially when added material makes the battery solution too strong, for then the plates may be softened or may lose their electric charge very rapidly, even when standing idle. One case like this showed six times the rate of loss that should occur, almost a half the charge escaping in four weeks.

Rice beads, used as embroidery on the new dresses, attract mice.

SAND INSECTS LIVE IN MINIATURE SAHARA

Just as cities have their hustling daytime populations and their night life denizens made up of quite separate classes of people, so the little Saharas on American sand dunes have entirely different day and night populations of insects. Prof. Royal N. Chapman of the University of Minnesota and some of his graduate students have discovered through a study of small dunes in Minnesota.

They found a night population consisting almost entirely of one species of beetle, which burrowed deeply into the ground at the first streaks of day, and remained there until dark came again. The daytime population was more varied. Both night and day groups were largely governed in their movements by temperature.

Heat conditions on the dunes are almost as severe as they are in the Sahara desert. Temperatures as high as 120 degrees Fahrenheit are not uncommon at the surface of the sand, though they are several degrees cooler a few inches above it; and below, where the beetles burrow, the temperature falls off as much as twenty degrees in three or four inches. Temperatures fluctuate violently; there may be as much as forty degrees difference between day and night.

ORPHANS' DREAMS EXPRESS WISH FOR HOME AND MOTHER

Are dreams really one way to enjoy things we want but cannot have in reality? So the psychoanalysts contend - and the dreams of orphans support this contention. For orphans, like other people, dream when they sleep, but their dreams have a striking similarity. Visions of mother, father, home, and in particular that the parents have come to take them home constitute orphan dreams.

That the dreams of orphans in institutions center about their one common experience, the loss of parents and home, is the result of an investigation by Dr. Kate Gordon of the University of Southern California. Of one hundred and five children questioned, eighty admitted dreaming and the dreams of fully half of these may be expressed in the typical statements "about mother" or "father came to get me". The dreams of another sixteen per cent. suggests fears of various sorts, as of tonsil operations. These fears may be regarded as "negative wishes". About eight children, or nine per cent. dreamed of toys, candy, money, etc., while a lesser number dreamed of religion.

Dr. Gordon's research seems to support the psychoanalytic view that dreams are one way people live out wishes which are unfulfilled in reality. And from a practical standpoint, it indicates that institutional life does not appeal to the child as a substitute for the intimate care of parents.

GERMAN INVENTS TALKING POSTCARDS

A postcard device that tells its message not to the eye but to the ear is the invention of Charles Rammelsberg, formerly of the German patent office. With a phonographic apparatus small enough to be carried in a pocket, the inventor states that anyone is able to make faithful voice records on gelatin films the size of postcards. Each record has a capacity of 600 to 800 syllables. To receive daily love-letters in the veritable voice of the sweetheart would greatly facilitate long-range courtship.

FLYING MOUNTAINS OF GRASSHOPPERS

By Dr. Edwin E. Slosson

Twenty-five trillion grasshoppers. Forty-four million tons of them. Covering an area of 2,280 square miles. All day long passing a given point. These are the figures given for a swarm making its migration from Africa to Arabia across the Red Sea on November 25, 1889; and the British naturalist, Dr. G. Caruthers, who observed the flight adds that it was not one of the largest swarms. He fails to furnish the figures on a real big one, perhaps because of inadequate facilities for taking a census of such a flighty population.

But the swarm that passed over Pretoria on May 25, 1891, is more generously and more accurately, or at least more definitely, estimated as composed of 130,842,144,000,000 individual insects. This swarm is said to have filled 12 cubic miles of space in the air.

The swarm that invaded Algeria in "the grasshopper year" of 1866 is estimated to have totaled 50,000 tons live weight on the wing. Apparently the insects were not counted in this case, but a count of the natives who died of starvation in consequence of their devastations is reported as 200,000.

On the island of Cyprus in 1883, the lady locusts laid five billion cases of eggs. I don't know how many eggs constitute a case, in this case, but the total weight of the lay is estimated at 4,000 tons.

No statistics are given as to the number of those who constituted the eighth plague of Egypt, but the Bible tells us that:-

" They covered the face of the whole earth, so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees which the hail had left; and there remained not any green thing in the trees, or in the herbs of the field, through all the land of Egypt."

I believe all these stories, and I would believe bigger ones if I could find them in any book at hand, for I can remember the grasshopper years of 1876 in Kansas. I cannot give the number of these Colorado tourists because I was then too young to count over a billion, but I know that they darkened the land like a storm cloud and did eat every herb of the land and sent back to live with wife's folks thousands of hopeful young settlers in the western commonwealth. We called them "grasshoppers", not "locusts", and I ought to know what they are since I have seen and swallowed them, and I am pleased to note that the Encyclopedia Britannica confirms our Western term.

I can add a detail of the grasshopper plague not mentioned by the author of Exodus, that they were so numerous as to stop the trains by greasing the track. Nowadays grasshopper grease is being used for lubricating airplane engines, a use we never thought of in 1876. It was recently reported that eighteen tons of dried locusts were shipped from South Africa to Holland for the extraction of the oil, which is said to retain its liquidity at very high altitudes.

It is nothing unusual to find great quantities of insects, especially grasshoppers, buried in snow fields and glaciers in the mountains. A very notable example of this is Grasshopper Glacier, in the Absaroka mountains, a few miles

north of Yellowstone National Park. The face of this glacier is marked with stratum after stratum of grasshoppers, and there are places on its surface where one can dig down a few inches with his fingers, and literally bring up solid handfuls of legs, heads, and other parts of grasshopper shells. Presumably great swarms of insects attempting to cross the glacier have been chilled and trapped, and subsequent falls of snow have incorporated their bodies into the ice.

The most amazing thing to a chemist is the gigantic scale and swiftness of this production of grasshopper meat. The estimate given for the weight of the Red Sea swarm is some seventy times the weight of all the copper mined in America in a year. That is to say, it would take us seventy years to produce copper enough to balance the grasshoppers produced in seven weeks in this locality alone. Biology is still far ahead of metallurgy as a large scale industry. A green crop converts the carbon, nitrogen, hydrogen, and oxygen of the air and water into plant protoplasm, and then comes a flying cloud and in a few seconds all this is gone into grasshoppers and the ground is bare.

It is not a simple process for producing a single element, like the smelting of copper from its ore, but more like the operation of an automobile factory. A grasshopper is a more complicated machine than an automobile and even Ford cannot catch up with the grasshopper in quantity production.

NORSE SCIENTIST SHOWS FINGER PRINTS INHERITED

Finger prints, the most certain of identification marks, are hereditary. One's distinctive pattern is like that of one's parents, and will be passed on to future generations with relatively little change. These results are announced by Mlle. Kristine Bonnevie, of the Royal Frederik University after exhaustive statistical study of the finger print records of the Oslo Court of Justice, which were put at her disposal.

Carrying her researches into the wider relationships of the human family, Mlle. Bonnevie has discovered that there is a resemblance between the finger print types of related races; the nearer the relationship the closer the resemblance. Finally, the similarity between the finger prints of apes follows the same rule of kinship.

WIRES MADE FLAMEPROOF BY SELENIUM TREATMENT

Fireproof insulation for telephone switchboard wires is made possible by a new use recently discovered of selenium, an element whose chief use hitherto has been in apparatus involving the control of electric current by light. The flameproofing of switchboard wires is highly important, for even a small fire can undo many hours of work and throw a whole exchange out of commission. Fireproofing substances now in use are only partially successful.

The peculiar thing about the use of selenium for this purpose is that the element itself can be burned. Only when it is used on the cotton covering of the wires does it take on fireproof qualities. But then the wires resist all ordinary flames, and even when ignited by the intense heat of a blowtorch goes out immediately when the outside flame is removed.